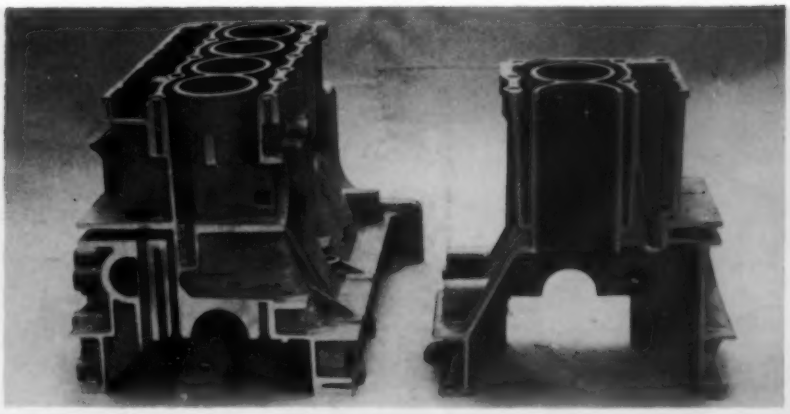
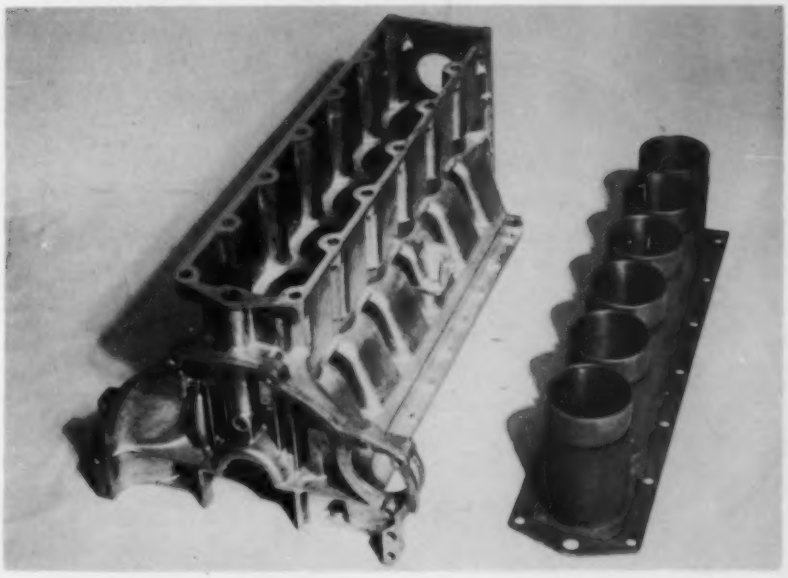
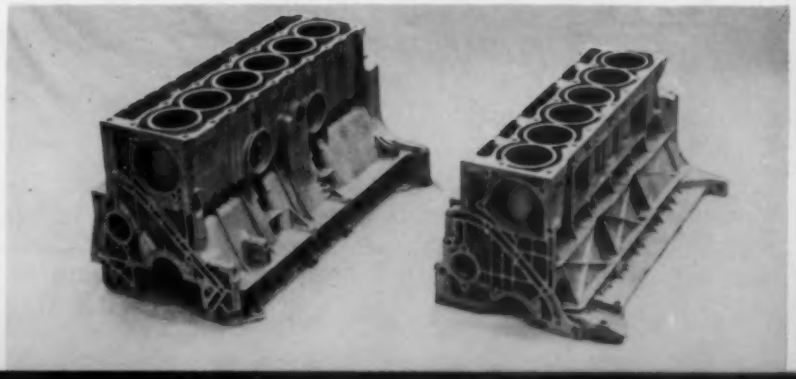
DIE CASTING ENGINEER

PUBLICATION OF THE SOCIETY OF DIE CASTING ENGINEERS / JANUARY 1961







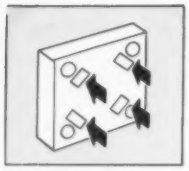
BLOCK STORY

By
A. F. BAUER

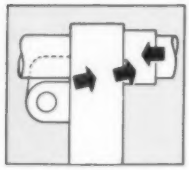
PAGE 7

FOUR-CORNER LOCK-UP

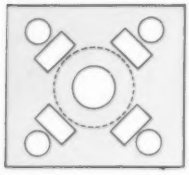
in Greenlee–B&T die casting machines offers you 7 benefits



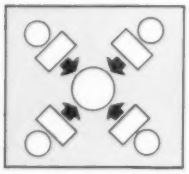
1. Each corner link is a strong, self-contained support for both plate and die.



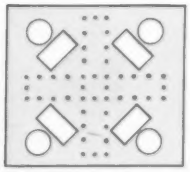
2. Short and direct transfer of loads on each corner minimizes bending stresses on the moving die platen and back plate.



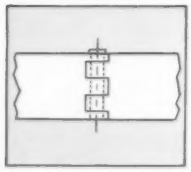
3. Reduces the area of unsupported moving die plate. Helps eliminate flashing and potential cracking of dies.



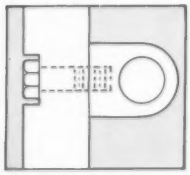
4. Prevents weaving of the link center axis (crosshead) and consequent unequal loading.



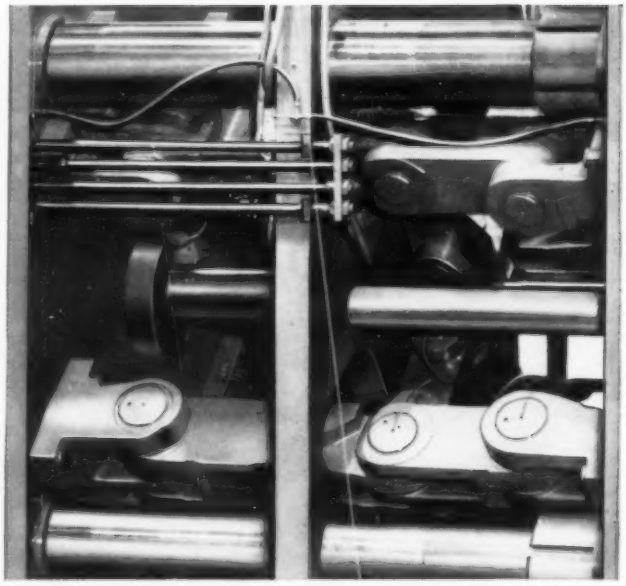
5. Permits a large area of both horizontal and vertical bumper pin ejection pattern.



6. Corner positioning of each link assembly results in equal and straight line loading of all pins and bearings in the link pivots.



7. Toggle anchors are bolted to the back and traveling platens. They are not subject to weld breaks or breakage as part of a casting.



Only in Greenlee — B&T Die Casting Machines will you find this unique toggle locking mechanism. Investigate its many advantages that help give you greater holding power, best die alignment and lower maintenance. Your Greenlee — B&T representative will be glad to arrange for a demonstration.

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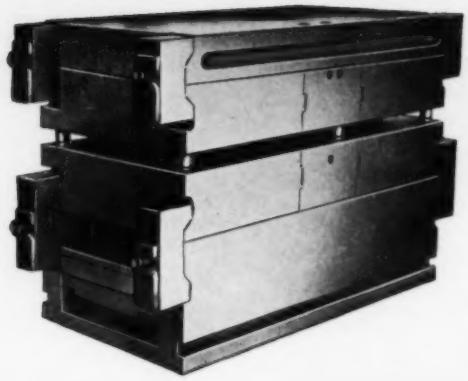

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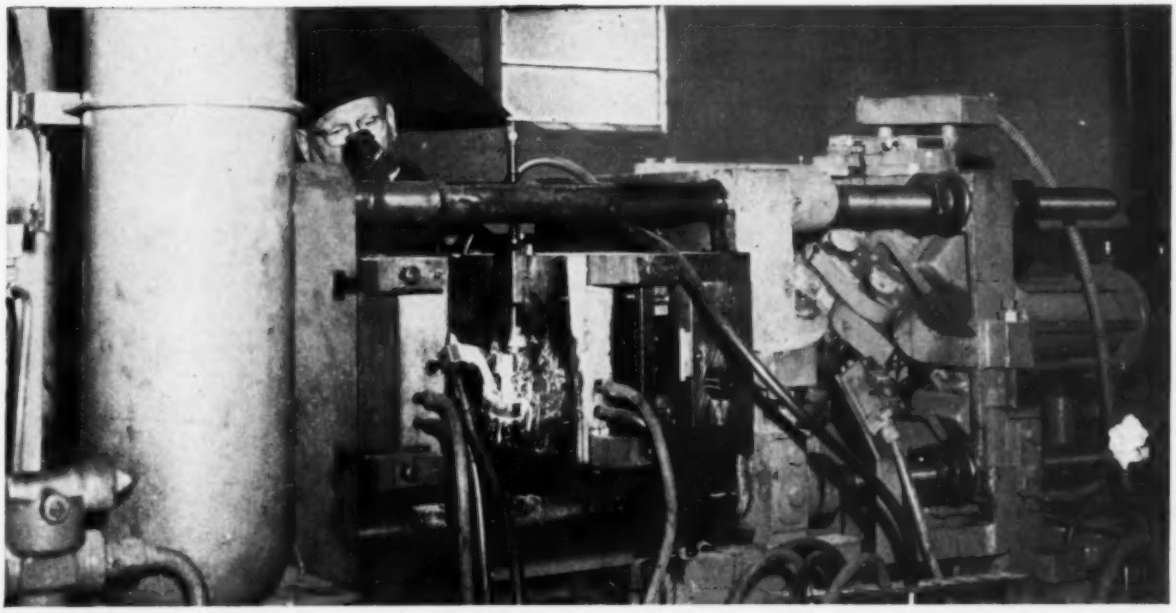

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DIE CASTING ENGINEER

Official Publication of The Society of Die Casting Engineers, Inc.

Executive Offices:
19382 James Couzens Hwy.
Detroit 35, Michigan
Telephone: UNiversity 4-9116

DIE CASTING ENGINEER is published bimonthly by The Society of Die Casting Engineers, Inc., a society for the improvement and dissemination of the knowledge of the arts and sciences of die casting, the finishing of metals, and the allied arts.

SUBSCRIPTION RATES: free to members of SDCE and, upon request, to qualified engineering and management personnel engaged in die casting, metal finish, and allied arts, and the government and university personnel. To others: $1.75 per copy; $6.50 one year; $8.00 one year to foreign countries.

Printed in the U. S. A. by Ann Arbor Press, Inc., 317 Maynard St., Ann Arbor, Michigan.

Address all correspondence to The Society of Die Casting Engineers, Inc. 19382 James Couzens Hwy. Detroit 35, Michigan

DIE CASTING ENGINEER

THE SOCIETY OF DIE CASTING ENGINEERS, INC.

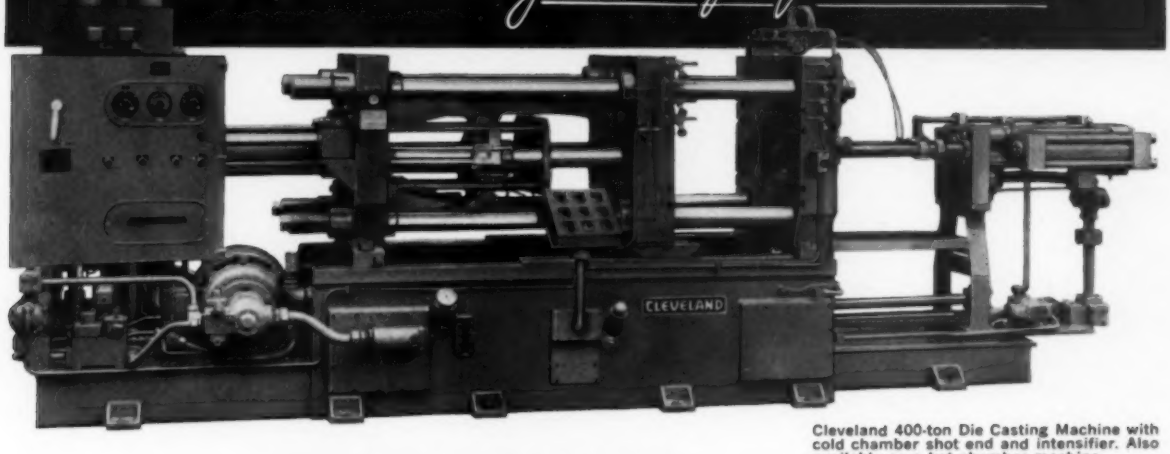
VOL. 5, NO. 1
JANUARY 1961

ARTICLES

DEPARTMENTS

NEW FEATURES*

mean even greater performance...

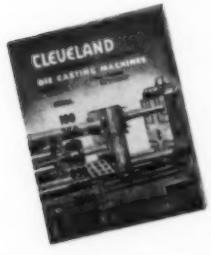


Cleveland 400-ton Die Casting Machine with cold chamber shot end and intensifier. Also available as a hot chamber machine.

from the CLEVELAND Model 400 DIE CASTING MACHINE

For its exceptionally fine performance with low maintenance, the Model 400 Cleveland is one of the die casting industry's most popular medium size machines. Now, new design refinements have been incorporated — see partial listing of features at right — which even further improve its performance, making the Model 400 Cleveland the outstanding machine in its class. Also attractively priced!

If your needs call for machines of other capacities, you'll find the entire Cleveland line to be as up to the minute in design and quality of construction as is the Model 400. Cleveland also builds 100, 250, 650, 850, 1000 and 2000 ton machines. And Cleveland is a leader in machine automation and vacuum die casting, should these optional features be among your production requirements. For detailed information, write direct, or call in a Cleveland sales engineer.



New general catalog describes the full line of Cleveland Die Casting Machines. Write for your copy.

Model 400 Specifications:

Size of die plates (ver.& hor.)	*40½" x 40"*
Space between tie bars	*20" x 24"*
Die Thickness (max. & min.)	*32"—12"*
Die opening (adjust.)	*6" to 12"*

* NEW DESIGN FEATURES INCLUDE:

- Locking pressure 400+ tons, strain gage tested by S.D.C.E. method.
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- New design cold chamber shot end; 4" dia. shot cylinder; stroke adjustable from 14" to 18". Shot intensifier available.
- New design hot chamber shot end permits quick gooseneck adjustment and removal. 4" dia. shot cylinder; 7" stroke. Telescopic tubes eliminate swivel fittings.
- Two-position shot injection adjustment on hot and cold chamber machines.
- Massive toggle linkage in horizontal plane provides maximum accessibility for locating ejector pins. S.D.C.E. recommended pattern for ejector pin holes and platen T-slots.
- Movable platen supported by rollers riding on hardened steel plates.
- Modern electric control panel and convenient operator pushbutton station. Machine operating sequences programmed by templates. Electrics designed to J.I.C. standards.

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PRESIDENT'S REPORT

By JOHN L. MacLAREN

IN 1960, under the capable leadership of President Ollie Clayton, the Society made the most important advances in its five year history. Our First National Die Casting Exposition and Congress held in November was the single most significant event of the year, but important advances were also made in enlarging the Society's individual, company and sustaining membership lists, in increasing geographical spread of the Society's operations (by adding the Saginaw Valley Chapter), in improving the DIE CASTING ENGINEER's technical and industry coverage, and in establishing sturdy financial and organizational bases within the Society upon which to grow.

As your new President for 1961, I propose to do everything I can to maintain, and if possible to improve upon, this rate of progress. It is a great honor, but also a great challenge, to occupy the Presidency of the technical organization representing the interests and objectives of such a dynamic and quickly growing industry as the die casting industry. With your help, I know that job can be done.

We sometimes tend to overlook the real reason why this Society was formed. This reason, in 1955 as today, is to assist those interested in the die casting industry, but particularly the die caster himself, in acquiring knowledge of the process and related arts through the encouragement of all forms of communication among its members. If we are successful in this task, and the die caster is helped materially in producing a superior product and meeting competition, then all of us connected with this great industry will prosper. To this end the National Office will develop and energetically pursue, in close collaboration with the Chapters, programs designed to increase membership in SDCE, particularly of die casters, attendance at Chapter meetings, and improved programming of speakers for the Chapter meetings.

Apart from the monthly meetings in the Chapter areas, our most important vehicle for communication of knowledge is the DIE CASTING ENGINEER. Noticeable improvement has been made in upgrading its contents in recent months, but much more can and will be done to carry this effort further.

Our November show was acclaimed by those who attended, exhibitor and visitor alike, as an outstanding worthwhile affair. Attendance at the Show was better than 5,000 persons closely connected with the die casting industry, including 120 from Canada and over 100 from a total of 13 overseas countries. The Exposition with its 98 separate exhibits, almost all of which had somethings to offer the die caster directly, allowed the visitor to investigate quickly and in depth the varied products and services used by him daily. The Congress, attended by 600 persons, offered 31 of the most interesting papers on die casting ever presented anywhere. The papers have now all been carefully and extensively edited and will soon be available in the bound form as promised attendees. The Banquet was also a notably successful occasion, attracting 500 industry members. Attendance at and interest in all of these activities far exceeded earlier expectations, and what is also important, each yielded a significant financial return to the Society. These funds will be earmarked for staging the next Show, but meantime will be used in an important working capital capacity.

Several important centers of die casting in North America are as yet unrepresented by local SDCE Chapters. To the end that *all* die casters may enjoy the advantages offered by SDCE, plans are being considered to organize several new Chapters by the end of the year.

This year can be one of continued, even accelerated, growth for the Society. It can see the services offered by the Society to the industry increased in scope and value. It can make membership in the Society more meaningful than ever before. I am confident that this year *will* see these things happen if we all work together actively and intelligently on the job at hand.

Letters to the President

Dear Mr. MacLaren:

We have no words to express our gratitude for all you did for the Japanese team of die casters during their participation in the National Die Casting Exposition and Congress held in Detroit from November 8 to 11 and their subsequent study and sightseeing tour.

With your assistance, the team safely returned to Japan on November 28. Please accept our sincere thanks for the opportunities given them for visiting many die casting plants in your country.

Having successfully achieved their objectives in the United States, the team members now have high hopes of turning to account their valuable findings in their respective business.

It is also our great pleasure that, through this contact, we have been able to make many acquaintances among the die casters of your country and to increase mutual understanding and trust between us. We are, indeed, looking forward to your next National Die Casting Exposition and Congress in 1962.

Thanking you again for your great hospitality, we remain,

Sincerely yours,

The Japan Die Casting Association

Tadashi Onoda, President

Dear Mr. MacLaren:

On behalf of the British and European delegates who attended the First National Die Casting Exposition and Congress at Detroit, I would like to congratulate you and the directors of the Society of Die Casting Engineers on the outstanding success achieved by the Society in all aspects of your promotional efforts. I know I speak for my colleagues in saying that both the technical papers and variety of exhibits on show aroused great interest in the newest techniques and future thinking in die casting and made our visit worth while.

It was a great pleasure both to myself and to my group to meet your members and discuss mutual die casting problems in such a friendly and informal atmosphere. The results of the personal contacts made and the wealth of knowledge obtained at the technical sessions will be of inestimable long term value to all of us. I would also like to thank you for the bountiful hospitality shown by the Society and your members to our own group during the whole period of the Congress.

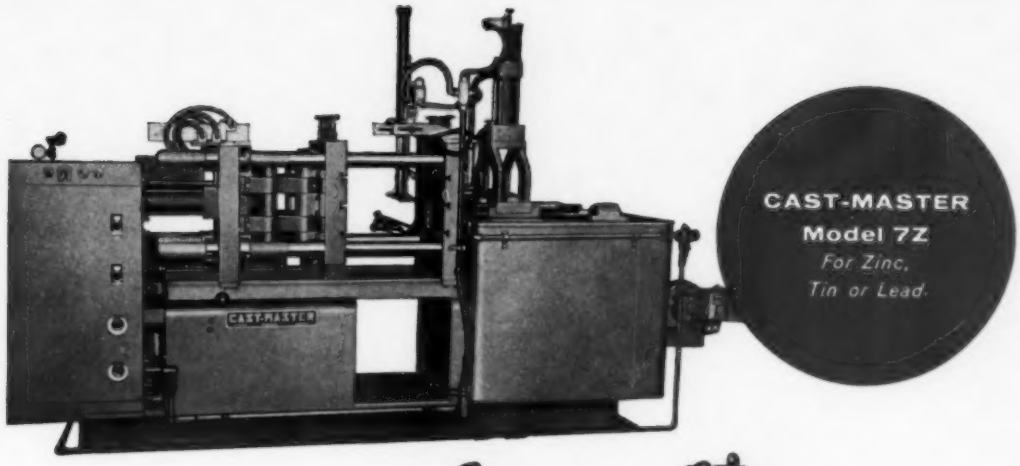
The Society must indeed feel proud of having achieved so much in such a comparatively short period, and I wish both yourself and your Directors every success in your future work. I am sure in this scientific age when air travel brings Europe and the U. S. so close together, that we shall meet again soon.

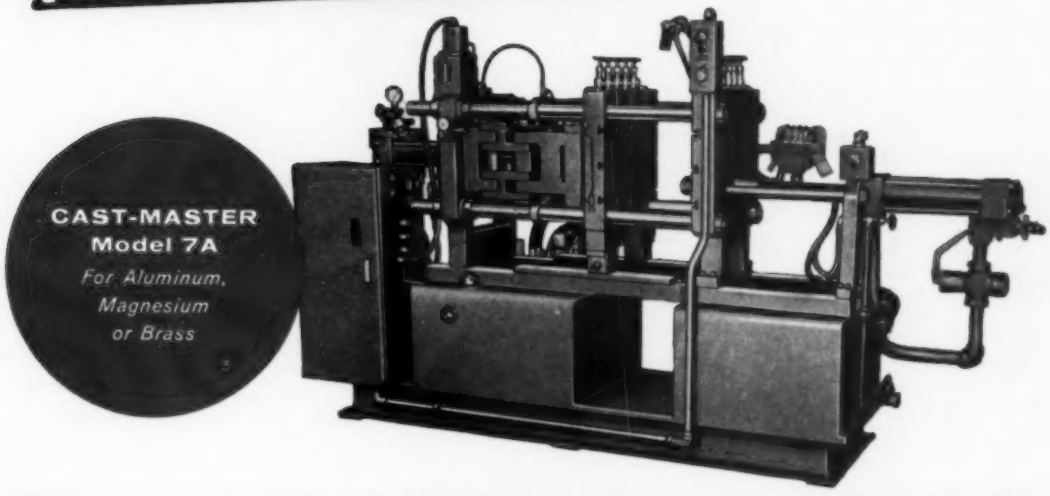
Yours sincerely,

J. A. Goddard

Zinc Alloy Die Casters Association

London, England





HARDWARE FINISH CASTINGS ON A VOLUME BASIS

SPECIFICATIONS

	Model 7Z	Model 7A
Die Locking Pressure	100 tons	100 tons
Distance between rods HxV	13½" x 13½"	13½" x 13½"
Tie rod centers, HxV	16" x 16"	16" x 16"
Tie rod diameter	2½"	2½"
Die mounting plates, TxHxV	3½" x 21½" x 21½"	3½" x 21½" x 21½"
Die thickness	4" min., 19" max.	4" min., 19" max.
Die stroke	4" min., 8" max.	4" min., 8" max.
Shot position	On center or 4" below	3½" below center
Shot cyl. dia.	2½"	3⅝"
Shot cyl. stroke	6½"	11"
Machine size, WxLxH	48" x 120" x 72"	48" x 120" x 58"
Weight, gross	6,900 lbs.	6,400 lbs.

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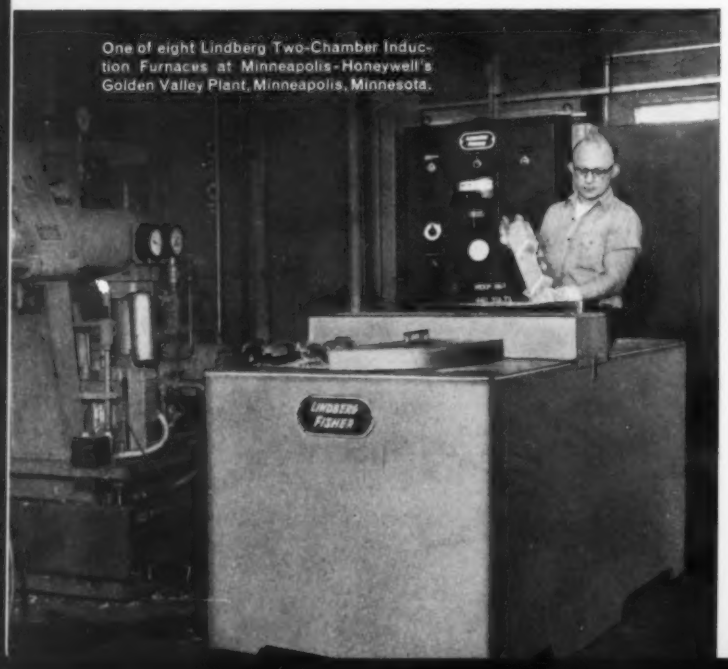
QUOTE

Mr. Art George, Senior Production Engineer, Golden Valley Plant, Minneapolis-Honeywell Regulator Company, Minneapolis, Minn.

"Our installation of eight* Lindberg-Fisher Two-Chamber Induction Melting and Holding Furnaces has given remarkable service for more than four years. In this period, with the help of a well executed Honeywell maintenance program, the installation has been unusually trouble-free. Only one of the eight furnaces has required relining over this long period. Handling more than 1,000,000 pounds of aluminum and zinc annually, the installation has unfailingly provided the consistently high quality of metal our precision instruments require."

**Altogether, 44 Lindberg Furnaces are in operation in various Honeywell plants.*



One of eight Lindberg Two-Chamber Induction Furnaces at Minneapolis-Honeywell's Golden Valley Plant, Minneapolis, Minnesota.

These eight Lindberg-Fisher Induction Furnaces melt and hold aluminum and zinc for die casting gas valve housings and other component parts. They are located at the die casting machines where ingot and scrap can be melted and held at the desired casting temperature in one convenient unit. Magnetic fluxing and stirring insures uniform temperatures and consistently clean metal.

In any production process where aluminum needs heat there is Lindberg equipment to apply it most economically and efficiently. Furnaces for melting and holding, casting stations, re-melting or heat treating are available in all capacities, electric or fuel fired. Get in touch with your Lindberg Field Engineer (see your classified phone book) or write us direct. Lindberg-Fisher Division, Lindberg Engineering Company, 2481 West Hubbard St., Chicago 12, Illinois.

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LINDBERG
heat for industry

The First Water-Cooled, Die Cast, Six-Cylinder Automobile Engine Block

By A. F. BAUER

Editor's Note: The First National Die Casting Congress sponsored by the Society in November 1960 presented 31 technical papers of exceptional interest to die casters. While the Congress was very well attended, the total of those present at the reading of these papers represents less than 15 percent of the circulation of this publication.

As it is the policy of the DIE CASTING ENGINEER *to bring to all of its readers the best current knowledge on die casting subjects, a selection will be made from the more timely of the papers for reprinting, in condensed form, in the next several issues.*

The die cast aluminum engine block is one of the more notable achievements of the industry. Therefore, this January issue presents two of the papers on this vitally important subject. The eminently qualified authors of these papers have achieved international status in this area and probably have contributed more to the introduction of die cast blocks in their respective markets than any other individual.

MASS production of the American Motors die cast, water-cooled, six-cylinder engine block is, we believe, an important milestone in the introduction of the all-aluminum engine. It is however only a milestone and as such it culminates the work of the past and points the way to further developments in the future.

By way of background, in April 1951, Doehler-Jarvis entered into a cooperative program with the Kaiser Aluminum and Chemical Corporation to design and produce a die cast, four-cylinder, water-cooled engine block and head for the Kaiser passenger car. This engine was completely designed for die casting and successfully tested in a few aluminum sand cast prototypes, but before the die was completed, the engine was changed to a six-cylinder engine.

In preparation for this large die casting, Doehler-Jarvis developed and introduced in 1954 the first 2,000 ton die casting machine ever built. The actual locking pressure was later on determined to be above 2,500 tons. Since this machine has proved the feasibility of large die castings, it represents therefore an important milestone in its own right.

In December 1955, Doehler-Jarvis successfully produced the first die cast six-cylinder engine block (figure 1). A large number of sample castings were run, but none of these castings was ever built into an operating engine.

When our negotiations with American Motors started, their engineers insisted from the very beginning that we adopt a dry sleeve design for their engine. On this basis the die cast design for the American

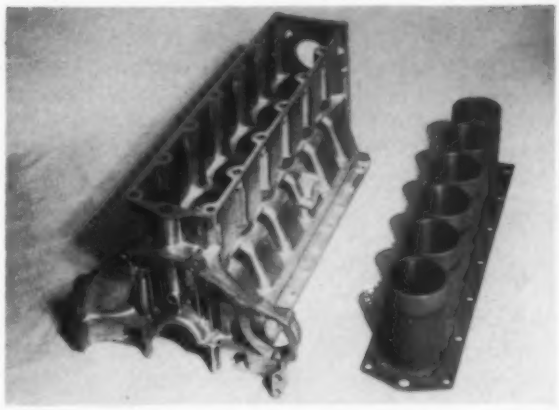

Figure 1

Motors engine block was worked out and first produced in September 1959. (It is shown on the right side of figure 2.) After minor corrections, 125 engine blocks of this design were produced in November 1959, put in cars and field tested by American Motors. The design was identified as "A" engine while further improvements led to the "B" engine block shown in the left side of figure 2. Samples of the "B" engine

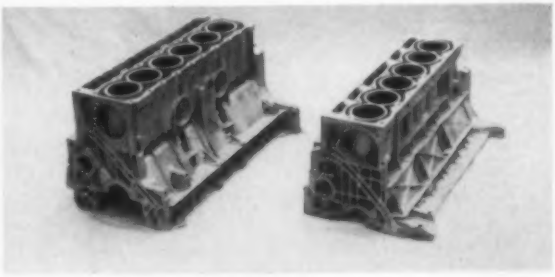

Figure 2

block were produced in March 1960. In July 1960, American Motors released the aluminum block program and production started first with only one die. Since three more dies had already reached the com-

Mr. Alfred F. Bauer is Assistant General Manager and Chief Engineer of the Doehler-Jarvis Division, National Lead Company. An engineering graduate of Stuttgart-Esslingen University, Germany, he was previously with the Mahle plant, Stuttgart, and the Magnesium Division of Dow Chemical Company. His paper was condensed from the one read at the First National Die Casting Exposition and Congress, Detroit, November 8-11, 1960.

pletion stage, it took only a few more weeks to get all four dies into production.

I wish to emphasize the joint nature of this entire project. In our work with American Motors, their Research and Engineering staff were most cooperative, constructive and forward-looking in their approach to the formidable die casting problems which we faced. These qualities were of prime importance in a project which involved a new material for engine blocks and a new application for die casting. I do not need to tell you that we had our full share of unforeseen problems which had to be worked out together. It was this fine cooperation more than anything else which made our success possible.

DESIGN FEATURES

The conversion of gray iron blocks into aluminum die cast blocks presents quite a few problems. The two most important are: a) avoidance of undercuts in the water channel system of the block; and b) a solution for wear resistant cylinder bores.

Both basic problem situations were resolved by selecting the "dry sleeve" design for the block, with gray iron sleeves cast-in and bonded with the aluminum. The block is open toward the cylinder head to overcome the undercuts in the water channel. The thin water channel cores admittedly make this part much more difficult to produce than the block with wet sleeves, and the handling and loading of the six gray iron liners necessitates complex automatic equipment. However the engine block with cast-in sleeves has so many advantages in physical strength and ease of machining that we consider this design today as the most advanced and most economical solution to the aluminum engine block.

In the past two years there has been much activity toward the development of engine blocks in hypereutectic Al-Si alloys with 16% to 25% Si content in the hope that improved wear properties would eliminate the need for gray iron sleeves in the cylinder bores. While tests with these hypereutectic Al-Si alloys are still continuing, it seems indicative of the course of development that all four aluminum engines (Corvair, American Motors Six, Buick V-8 and Chrysler Six) recently introduced in the passenger car field have gray iron cylinder bores.

For the American Motors engine blocks we have chosen a eutectic Al-Si alloy with 12% Si known under the ASTM specification as S12A. This alloy has adequate physical properties, good corrosion resistance, excellent castability, good machinability and has been used in the past for sound, pressure-tight castings. The cylinder bores are equipped with centrifugally cast liners BMI bonded to the aluminum. The greater hardness of these centrifugally cast liners and the ability of aluminum to dissipate heat at a faster rate than gray iron result in superior wear characteristics.

Even if future tests should show that hypereutectic Al-Si alloys give satisfactory wear results with unprotected cylinder bores, I venture to say that based on our present status of the die-casting technique, such an engine block without cast-in sleeves would be more difficult to produce and therefore be more expensive than engine blocks in a standard aluminum alloy with cast-in liners. With a draft angle of 1° in the aluminum cylinder bores, heavy machine stock would have to be removed, creating a serious porosity problem in the cylinder bores where absolute soundness is essential for the efficient operation of the engine.

There are of course many other conversion problems which necessitate a redesign for aluminum. The next three in sequence of importance are the heavy walls behind the main bearings, the oil gallery and the camshaft bores.

The holes for the oil gallery can either be cored from two sides with long hydraulic core pulls or built with an open channel which must be covered up as shown in the picture. Another solution is to cast in a steel tube as demonstrated with the block on the left. Each one of these solutions is acceptable and the selection depends very much upon the design of the block.

The elimination of heavy wall sections behind the main bearings presents a more serious conversion problem. While the walls above the two outer bearings can be cored out properly from the outside, the heavy wall sections above the inner bearings are difficult to avoid in almost every engine block. (Figure 3 shows on the left a cut through one of the inner main bearings, indicating how this has been accomplished in the American Motors block.) There are still some

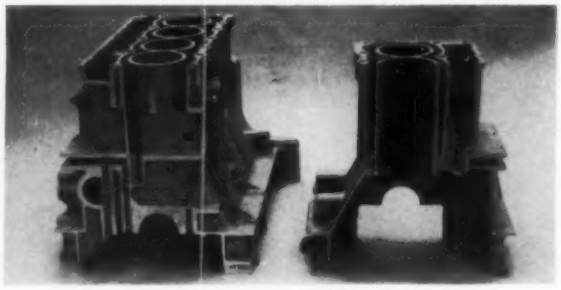

Figure 3

heavy sections left in the areas around the bearing; however, in all other sections the wall is quite uniform.

Heavy walls tend to create a local overheating condition in the diecasting die and promote shrinkage porosity which can be serious if oil holes must be drilled through these sections. Therefore all holes should be cast in, angular holes should be avoided and the area above the main bearings should be cored out as much as possible. On the right side of figure 3 is shown a cut through the cylinder bore which gives an indication of the long thin cores which build the water channel around the cylinder bores. This is undoubtedly the most critical section of this engine block.

This cut shows also the cast-in gray iron liner with its excellent bimetallic interlock bond (BMI) which is of mechanical nature but extremely strong. (See Doehler-Jarvis Research Bulletin of August 1959.)

The camshaft bores can be cored from both sides. Since however these bores are always located close to the outside walls of the block and since the cores for the second and third bearing have to pass through the impression block of the crank case, this solution results in a most undersirable die design which will cause excess breakdowns and high maintenance costs. If the camshaft cannot be moved into the cylinder head the best solution and the one we have chosen is to cast these camshaft holes with loose pieces.

UNIFORM DISTRIBUTION OF STRESS

The most economical design calls for a careful evaluation of the stresses in engine blocks. Sections with heavy stresses must be strengthened through increased walls and added ribs, while walls with extremely low stress levels should be reduced to save weight. Because of its high metal cost it is extremely important to design for the most economical wall thickness in aluminum by creating as uniform a distribution of stresses as possible. Since the well-known stress lacquer method is very sensitive to moisture and heat, we have applied the Zandman photostress analysis to determine these stresses in the engine block under static and dynamic conditions.

The photostress analysis reflects the stresses through a plastic coat and polarized light in color fringes which can be easily seen and interpreted as p. s. i. stresses by use of charts. Its biggest advantage over the stress lacquer method is that the tests can be repeated, that color pictures can be taken and that cyclic dynamic stresses can be filmed. We have been able to take a movie of these dynamic stresses under full torque load and varying revolutions of the engine and believe that this is the first time that a photostress analysis of an engine under dynamic conditions has been made and color filmed.

The photostress analysis applied to this engine block has helped us to recognize the weak areas of the block in the early development stage and therefore reduced the introduction time of this engine block and the field test procedure by many months. We consider the technique today to be an essential tool in the proper design of highly stressed aluminum die castings and the best method of designing aluminum die castings for lightest weight and greatest strength.

THE DIE CASTING DIE

The die casting die for the American Motors six-cylinder engine block weighs approximately 25 tons. (Figure 4 shows the cover and ejector half of the die. Since the four big slides in the ejector half are in the closed position, not much of the intricate cavity in the ejector die can be seen in this illustration.) Then the

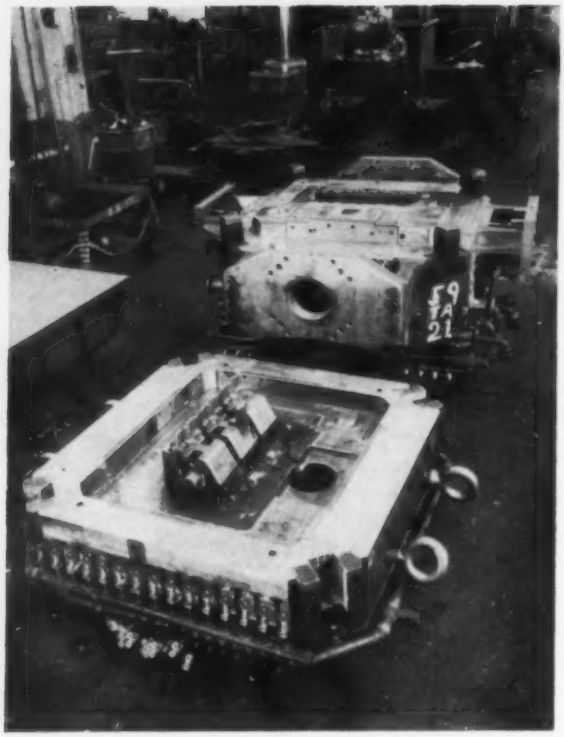

Figure 4

die is mounted in the die casting machine and the core pull cylinders attached, it has a die height of 62 inches, a vertical span of 11 feet and a horizontal span of 9½ feet.

The holding blocks for these large dies are made from heat treated low alloy *cast* steel since no forging press is large enough to produce these parts as a forging. The die impression is divided into more than sixty separate pieces of H-13 hot work steel, properly keyed and bolted together.

This hot work die steel has been more or less the standard aluminum impression steel for the industry and has proved rather satisfactory for regular dies. However when 70 pounds of aluminum are cast on each shot, the steel is subject to very serious thermal stresses, resulting in early heat checking of areas near the gate. The die must therefore be designed so that portions of the impression adjacent to the gate can be economically and easily replaced.

All other problems of minor importance on smaller dies become much more critical on large dies. The heat balance on large dies is extremely important. Thin, long cores surrounded by heavy sections of aluminum may overheat and cause soldering, heat cracks and porosity. Therefore the proper cooling of these exposed die sections is of utmost importance. In this engine block die, over seventy separate cooling systems have been applied to accomplish the necessary internal cooling for all major parts of the die. The block has 142 holes which are all cored. These relatively small cores are subject to wear and breakage and present quite a serious breakdown problem if the cores cannot be replaced in the die. The die has therefore been designed to permit changing the cores while the die is still on the machine. In fact we have even gone so far as to design the die casting machine to facilitate changing of these fragile cores.

The ejector die half with its large side cores is so big that the upper two tie bars of the die casting machine must be removed before it can be taken off the machine. In order to give you an idea of the tremendous size of this die and the complex handling problem, I should call your attention to the two big side slides in the vertical direction which have a projected area of 325 square inches and have to be locked against the impact of the injected metal with 1,500 tons of pressure. The lower slide of this die weighs approximately three tons and special equipment is necessary to remove it from the die and machine.

THE 2,000 TON DIE CASTING MACHINE

Four 2,000 ton die casting machines of our own design have been built to produce blocks (figure 5). Since the engine block with cast-in liners has a weight of 68 pounds, the die casting machine must be equipped with automatic ladling of the metal and with an automatic loading and unloading system. The bridge on the top of the die casting machine carries the loading and unloading mechanism which is tuned into the machine cycle automatically so that the operator has only to push the button to go through the entire sequence of operations.

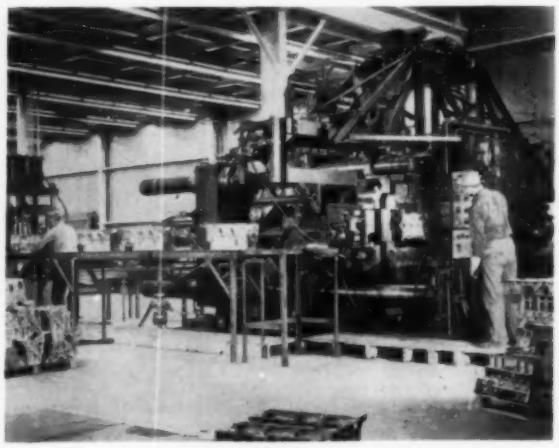

Figure 5

There are three men on each machine—the operator, who has the overall responsibility for the production; his helper on the other side, who loads the gray iron liners into the automatic loading station and helps to clean the die; the third man, seen at the left, operates the hydraulic trim press and has time enough to visually inspect each part and keep production records.

Seventy pounds of molten aluminum are auto-

(Continued on Page 27)

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Die Cast Engine Design for the European Market

By G. TRIULZI

WE will not talk about the evolution of die casting during the past 50 years as a development of a technological process, because everyone knows about its present possibilities, its advantages and its technical and economical inconveniences as compared to other processes. We should try to avoid these inconveniences by improving the cooperation with the metallurgists, the die-manufacturers, the designers and the machine makers. This continuous research improves the mechanical means and enlarges the limits of this field.

Rather than speak about the future of die casting in a general way, a hard, extensive and debatable subject, I will stay within more narrow limits, which are of immediate interest. I will deal with the present dimensional limitations of the castings and with the experiences and aims for the very near future.

The automotive industry is the most extensive market for large pieces, both in America and in Europe. For economical reasons—mass-production, equipment, cost of material and labor—the use of castings is not the same in all the countries. In Europe, in fact, die castings are used more than in America, where it has been replaced by fabrications, as is the case of stators and brake shoes.

However, among all industries the automotive is the one requiring the largest pieces, as evidenced by the increasing interest in the aluminum cylinder block. It is well known that the first experience in this field took place in the United States. In Europe the matter is taking longer. Big firms are still casting cylinder blocks made of cast iron. Smaller companies (if you except an important German firm which has been manufacturing the pieces in Al. and Mg. alloys from the start owing to the special design of its motor) have made a further step by producing the aluminum blocks by permanent molding.

Everybody is looking forward to the first results and some modifications are already being introduced to the design. From the thermo-dynamic point of view there are no objections from designers; the manufacturing technicians prefer it, since it enables higher machining speeds to be obtained. Now is a suitable time to start die casting blocks.

Russia is the first country to try this new system. At the end of the year a 4-cylinder engine block die will be ready. It will be water-cooled, will have 2.5 litre capacity, and the sleeves will be inserted after casting. It will be fitted to a 2500-ton machine, manufactured in Italy. The design of the cylinder block has been studied for a long time in order to avoid as much as possible all breakage caused by wear after long use, bearing in mind the mechanical characteristics of the casting and its reduced metallurgical properties due to the special casting system. (Figure 1 shows in detail the casting. Figure 2 shows the position of the piece in the die.)

The machine used for this purpose is the largest unit in the world manufactured up to now. Its clamping has been designed with special conceptions in order

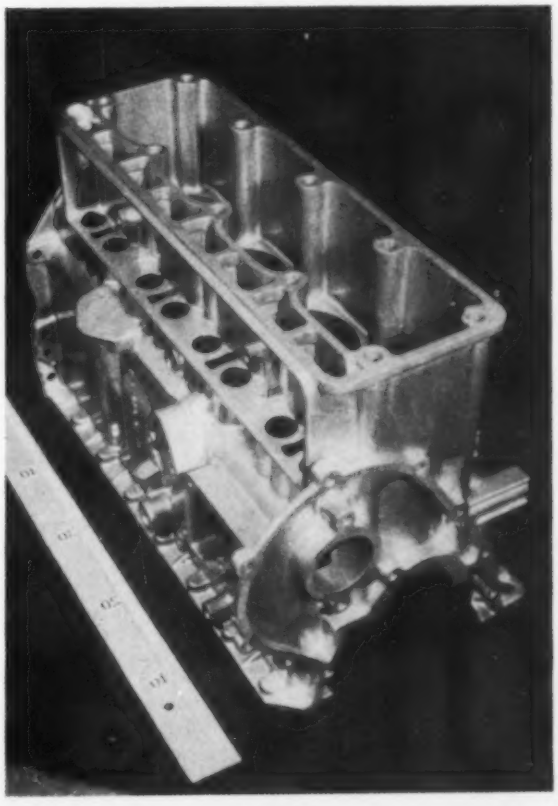

Figure 1

Mr. G. Triulzi is President of A. Triulzi, S. A. S., Milan, Italy, one of Europe's most prominent manufacturers of die casting and injection molding machinery. *His paper was read at the First National Die Casting Exposition and Congress, Detroit, November 8-11, 1960.*

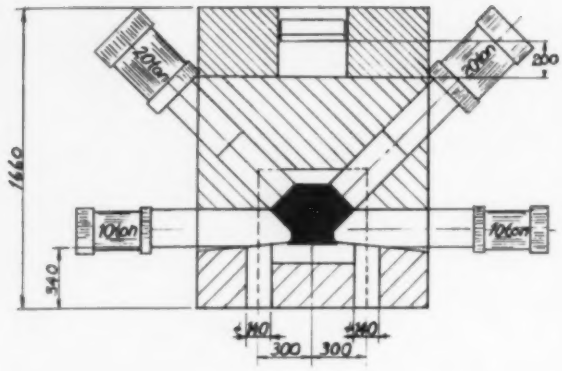

Figure 2

to obtain the huge dimensions required by the piece. (Figure 3 shows the machine in detail.)

By the time the die and the machine will be ready for operation, a reverberatory furnace will also be ready. This furnace embodies a special automatic ladling device for the shot sleeve. The equipment has already been tested on several smaller size machines. (Figure 4 shows the machine with the furnace.)

Electro-hydraulic equipment has also been studied to unload the casting from the die and to convey it to machining. (Figure 5 shows the unloading device and conveyor.)

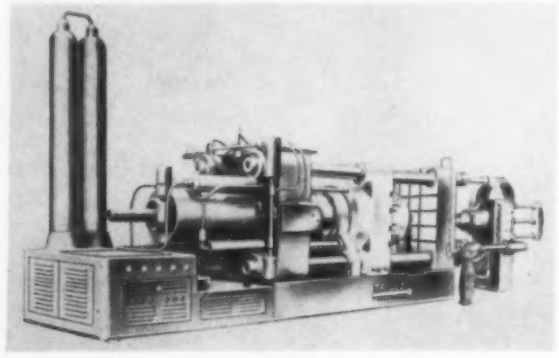

Figure 3

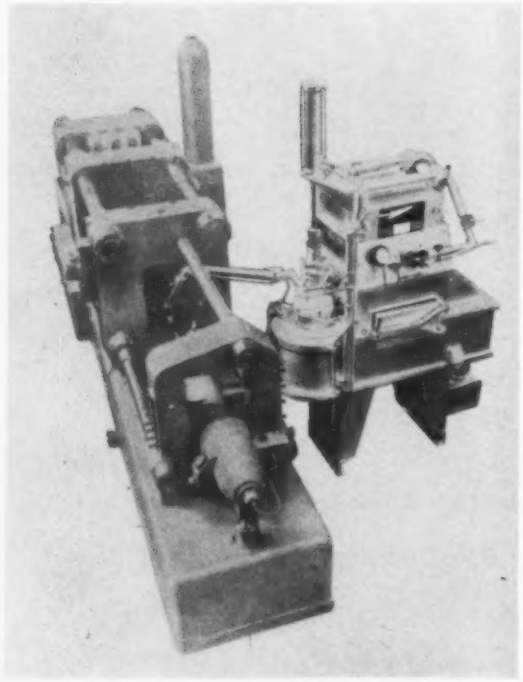

Figure 4

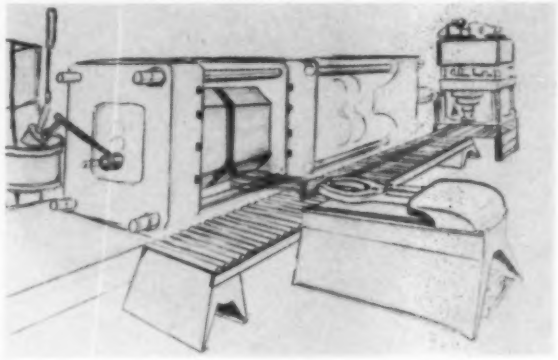

Figure 5

Therefore, according to the layout, the casting cycle will be fully automatic; all the worker will have to do is to start the machine, after which the following operations will automatically take place: clamping the die, metering the melted metal, injection, opening the die, pulling the cores, ejection of the pieces, unloading and conveying the pieces to machining.

As I said, the sleeves will be assembled to the casting in a second operation. If the design requires casting the sleeves directly in the die, a sleeve loading device can easily be designed. Another system which could improve the quality of the castings is the use of vacuum die casting. In principle, there should be no need to introduce the vacuum device, but we cannot state this as a rule, since up to now we have no results in this connection; anyway, at present there are several ways to evacuate the air from the die either by means of a hood or by evacuating directly into the die cavity.

The main features of the die-casting machine are as follows:

clamping force	2,500 tons
moving platen stroke	1,500 mm. (59″)
opening between platens	2,700 mm. (106½″)
weight	150 tons (approx.)
injection force	170 tons
injection capacity	90 lbs.
max. pressure on the metal	21,000 lbs./sq. in.
speed	100 dry cycles per hour (approx.)

The furnace features are as follows:

capacity	1,300 Kgs. (2,800 lb.)
production	800 Kgs. (1,700 lb.)
max. metering	100 lbs.
min. metering	25 lbs.

reverberatory melting system with automatic loading of ingots

(Continued on Page 28)

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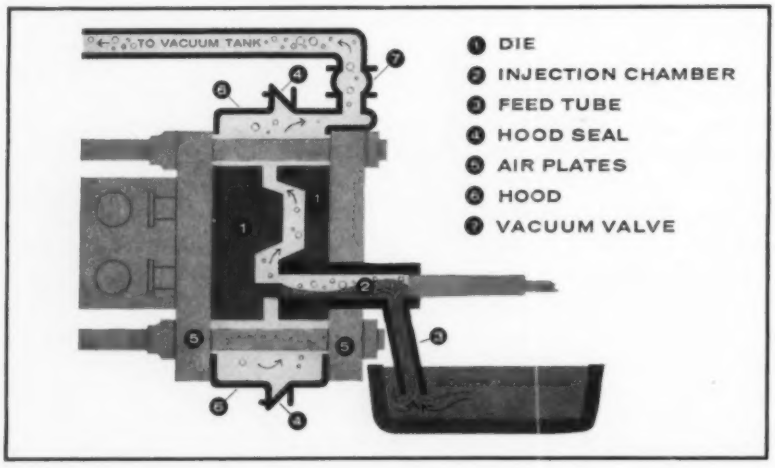
REED-PRENTICE
DIE CASTING NEWSLETTER

a look at vacuum die casting, its use and importance.

Vacuum die casting of aluminum offers as much promise for product design as vacuum die casting of zinc has in the past few years. Major improvements such as cleaner, lighter castings from a new spectrum of aluminum alloys make possible the use of new finishing operations as applied to die casting. In general, greater liberties can be taken with part design. Compositions that can be anodized, heat treated or brazed can now be successfully die cast. Improved tensile strength and uniformity make thinner walls and less support-metal practical.

REED-PRENTICE has developed an automatic vacuum feed system that successfully combines vacuum die casting of aluminum with automatic ladling. This VACUFEED system, as the diagram shows, first transfers the aluminum from the furnace to the injection chamber in a fully enclosed passage maintained at pouring temperature. This protects the metal from oxidation and temperature fluctuation. Second, the molten metal is drawn from below the surface of the melt. There is no inclusion of the surface dross to impair the properties of the die casting. And third, each shot of molten aluminum is accurately metered.



The field for vacuum die cast aluminum parts is broad and growing—from thin, colorful, automotive trim strips and grill decorations to small watch cases, appliance parts and electronic components. REED-PRENTICE VACUFEED enables engineers to specify vacuum cast aluminum parts—with all the inherent die casting advantages—for designs and compositions never before considered. REED-PRENTICE engineering has pioneered to find the best way to die cast aluminum with a vacuum. The advantages are many, the savings greater and, most important, the complete equipment is manufactured by REED-PRENTICE. Complete details on the techniques of VACUFEED die casting is as close to you as your nearest REED-PRENTICE Sales Engineer. Call him today.

Duties of the Die Casting Engineer

By LEE G. AXFORD

THE Die Casting Engineer performs a variety of services for many of the departments of a die casting plant. These services are vital to the departments concerned, and failure in performance can be crippling. The functions and departments who look to the Die Casting Engineer for advice are as follows:

(a) **Management**—Top management depend on him to offer engineering advice which will permit them to install the most competitive equipment and production processes, in order to earn a profitable return on investment.

(b) **Financial**—The financial officer looks to him for capital investment figures to back up both short and long range planning in the area of improvements in plant and equipment.

(c) **Purchasing**—The purchasing agent relies on his judgment in the matters of price, specifications and delivery when equipment and tools are bought. The Die Casting Engineer often acts as a contact man for the vendors of materials and equipment, consulting with them on specifications, designs, and new ideas.

(d) **Sourcing**—In the larger captive plants making and using die castings in their end products, his direction is requested in "make or buy" situations involving die castings.

(e) **Personnel**—The personnel manager frequently requests his help in selecting personnel, overcoming safety problems and correcting conditions which have led to labor disputes.

(f) **Production**—To keep the operation running profitably, the production head relies heavily on his judgment in the choice of processes, tools and equipment.

(g) **Product Engineering**—The product engineer consults him on the best casting design for economic production on available equipment.

The size of the plant governs the status of the Die Casting Engineer. In a small operation, the owner may do his own engineering, or he may rely on outside professional services. Some small plants receive these services from a Die Casting Engineer who contracts with several others. However, it is in the larger plants having such departments as tool engineering, plant layout, industrial engineering, metallurgist, etc., that the Die Casting Engineer's contribution is most appreciated.

The management of such a company looks to him for advice in three areas which are critical in their impact on profits:

1. The costs of long-range planning involving new equipment and processes must be estimated by the Die Casting Engineer. When programs are initiated, he must also plan efficiently the phasing out of the old production equipment and the introduction of the new.
2. When management decisions are made on the equipment and tooling, the Die Casting Engineer is responsible for ensuring that they are designed and built as specified, properly installed and fully tried out, before being turned over to the Production Department as acceptable.
3. Management continually places great reliance on the Die Casting Engineer for his volunteered advice on such subjects as improved casting design for minimum tooling, material and production costs, methods for speeding up casting and secondary operation cycles, etc. As these areas are his special province, he has an obligation to management to observe, check and report regularly.

When an inquiry on a new casting is received, the Die Casting Engineer enters the picture almost immediately. Many customers today insist that quantities sent out by their die casting vendors be accompanied by an "in process" casting drawing, so that the customer knows that the vendor completely understands the requirement. By requesting revisions in dimensions and tolerances, the Die Casting Engineer may frequently negotiate changes which result in lower piece and tooling costs. Quite often this procedure is followed informally between the Die Casting Engineer and the customer, without the issuance of "in process" drawings.

The Die Casting Engineer also becomes involved in estimating the cost of equipment, tools, gauges and all facilities needed to produce the casting. In performing this function, he should estimate not only on the basis of utilization of existing facilities, but also on the basis of new, more efficient facilities. It then becomes management's responsibility to assess whether long range plans might be furthered through the acquisition of the new facilities at that time.

As timing is a vital factor in the execution of any production job, the Die Casting Engineer must also furnish an estimate of the time phases involved in designing, tool construction and tryout.

When management has successfully quoted on the job and has given the Die Casting Engineer authority to proceed, it then becomes his responsibility to police his earlier estimates of time and cost. Where revisions become necessary or desirable, he must of course communicate this information to management for a decision .

The management of a die casting plant places great reliance on the judgment of the Die Casting Engineer; in turn, it becomes the obligation of the Die Casting Engineer to gain his management's confidence by exercising every effort to do his difficult job well.

50 million castings a year

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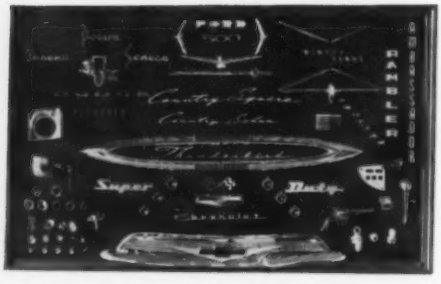

from these KUX die casting machines

"THE PRIMARY concern of the major automobile manufacturers for die-cast trim parts is *quality*," says John Airey, president of Trilex Corporation, important suppliers in the automotive and appliance field. "That's why we have use KUX Die Casting Machines since 1945. They produce hardware finish quality castings.

"But along with quality," Mr. Airey continues, "auto makers as well as appliance men consider *price*. We've found that KUX machines can be depended on for minimum maintenance and minimum downtime. They put us in a better position to compete on a cost-per-unit basis."

Whether your main concern is lower production costs, higher quality or both, investigate the advantages of KUX Die Casting Machines. 28 all-new strain gauge proven KUX models, 50 to 2000 tons, for both hot or cold chamber operation, available with automatic cycling mechanism and KUX patented "Vac-U-Die" and "Auto Feed" systems of vacuum die casting.

Write for full details of the 28 all-new KUX models illustrated in the latest KUX Die Casting Machine Catalog.

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CHAPTER NEWS

DETROIT

1 The Detroit Chapter of SDCE heard Russell B. Newman, Manager of the Listerhill Reduction Plant, Reynolds Metals Company, Sheffield, Alabama, talk on "The Production of Primary Aluminum" at its December meeting. The dinner affair was held December 6 at Devon Gables, Bloomfield Hills.

SAGINAW VALLEY

2 The Saginaw Valley, Michigan, Chapter of SDCE met November 16 to hold its annual elections and see a 30-minute color and sound film on "Die Cast Supervision Training." The meeting was held in the High Life Inn on Dixie Highway, Saginaw.

TOLEDO

4 Philip R. Kalischer, Editor of "Precision Metal Molding," spoke on "Where Is the Die Casting Industry Going?" at the January dinner meeting of the Toledo Chapter of SDCE. Members and guests attended the session at Angelo's Spaghetti House, Toledo, on January 10.

The December 13 meeting, also held at Angelo's, featured J. B. Kelley, President of the Die Casters' Service Division, Pneumatic Power Equipment Corp., and Sales Manager of the Rex-Buckeye Company. His talk, "Why Do It the Hard Way?" dealt with observations made in the field, corrections in practice to obtain improvements in quality and reduction in cost,

(Continued on page 20)

CHAPTER NEWS

(Continued from page 19)

and "tips" to eliminate "headaches" and "heartaches" often accepted as standard routine by die casting plant supervision.

NEW YORK

7 The New York Chapter, SDCE, met on November 30 at the Hotel Governor Clinton, New York City, with Richard M. Olsen, Eastern Representative of Kux Machine Co. as speaker. His topic was "A Visit to Twenty-One Die Casting Plants and Five Countries."

One of the major activities of the Society in 1960 was the attendance by a group of members at the International Pressure Die Casting Conference in Stresa, in northern Italy, during May. Forty-three SDCE members, most of them with their wives, visited die casting plants and toured Great Britain and the continent before and after the Stresa conference. Especially memorable was the hospitality of the management of plants in Europe and their interest in pointing the way toward solving shop problems.

The Conference offered valuable technical information and furnished members a chance to exchange opinions and become acquainted with European die casters. Mr. Olsen captured this trip on motion picture film and slides in color. He compiled a commentary of his experiences to accompany the pictures.

CENTRAL NEW YORK

9 "Automotive Plating – More Durable Today" was the subject of John Tierney's talk before the Central New York Chapter of SDCE meeting on November 29 at the Drumlins Country Club, Syracuse. Mr. Tierney is Manager of the Process Engineering Dept., Brown-Lipe-Chapin Division, GMC.

The second annual Christmas party of the Central New York Chapter was held on December 22 at the Cavalry Club.

NEW ENGLAND

18 Laurence Fountain, President of the Fountain Plating Company, Chicopee Falls, Mass., spoke on "Metal Finishing of Zinc and Aluminum Die Casting Alloys" at the last meeting of the year of the New England Chapter of SDCE. New chapter officers were also elected at the meeting, held November 17 at the Publick House, Sturbridge, Mass.

Mr. Fountain discussed the ever present problem of what constitutes a satisfactory casting for metal finishing and showed how preliminary preparation costs are affected by the casting quality.

INDIANA

25 "Ladies Night," the first such affair of the Indiana Chapter of SDCE, was held December 8 at the Casa Grande Restaurant in Kokomo. A cocktail hour, sponsored by suppliers of die casting steels in the area, preceded the business meeting.

FIRST NATIONAL DIE CASTING EXPOSITION & CONGRESS

DETROIT, MICHIGAN
NOVEMBER 8-11, 1960

TECHNICAL PROGRAM REPRINTS

☐ **PAPER 1. MATHEMATICAL DETERMINATION OF DIE DESIGN.**
John Caster, Research Staff
Syracuse University Research Foundation.

☐ **PAPER 2. SOME RELATIONSHIPS BETWEEN ALUMINUM DIE CAST-CASTING DESIGN AND GATING VARIABLES.**
John Lapin, Supt., and Richard V. Stumph, Sr. Engr., Die Casting Operations
Central Foundry Div., General Motors Corp.

☐ **PAPER 2A. A CASE STUDY IN DIE DESIGN FOR ALUMINUM AND MAGNESIUM DIE CASTING.**
Matthew McIntyre, Tooling Manager,
McCulloch Corporation

☐ **PAPER 3. MOLD FABRICATION—COST REDUCTION AND CONTROL.**
Rolf H. Berg, V. P. & Treas.
Atols Tool & Mold Corp.

☐ **PAPER 4. AISI H-13 STEEL AS USED IN THE DIE CASTING INDUSTRY.**
Arthur E. Scholz, Tech. Serv. Engr.
Customer Tech. Service Dept.
Crucible Steel Co. of America

☐ **PAPER 5. TEMPERATURE RELATED TO MOLDS AND CASTING PROPERTIES.**
Ross Dean, Sales Mgr. & Dir.
Sterling, Inc.

☐ **PAPER 6. STUDIES ON THE INFLUENCE OF GAS CONTENT, PRESSURE AND MAGNESIUM CONTENT ON THE MECHANICAL PROPERTIES OF ALUMINUM DIE CASTINGS.**
Werner Ruegg, Head, Chem. &
Metallurg. Labs and Research Dept.
Injecta Limited

☐ **PAPER 7. ALLOY CONTROL FOR ZINC DIE CASTINGS.**
J. L. Kimberley, Exec. V.P., and
Ernest W. Horvick, Market Dev. Engr.,
American Zinc Institute.

☐ **PAPER 8. METAL HANDLING AND CONTROL.**
F. William Foss, Chief Engr.,
Apex Smelting Co.

☐ **PAPER 9. METALLOGRAPHY OF DIE CASTING DEFECTS.**
G. Leslie Armstrong, Chief Metallurgist,
U. S. Reduction Co., and
Robert Harder, President
Lukens Aluminum Co.

☐ **PAPER 9A. ALUMINUM IN THE AUTOMOBILE ENGINE.**
P. R. Kalischer, Editor
Precision Metal Molding

☐ **PAPER 9B. DIE CAST ENGINE DESIGN FOR THE EUROPEAN MARKET.**
G. Triulzi, President
A. Triulzi S.A.S.

☐ **PAPER 9C. THE FIRST WATER COOLED DIE CAST 6 CYLINDER AUTOMOBILE ENGINE BLOCK.**
A. F. Bauer, Chief Engr. and Asst. G.M.
Doehler-Jarvis Div., National Lead Co.

☐ **PAPER 10. SOUND DIE CASTING WITH SOUND.**
John E. Weber, Gen. Mgr.,
Southern Die Casting & Engineering Co. and
Earle W. Rearwin, Chief Eng., Die Cast Machines, Reed-Prentice Div.

☐ **PAPER 11. PLATING AND ANODIZING OF ALUMINUM DIE CASTINGS.**
Robert Harder, President
Lukens Aluminum Co.

☐ **PAPER 12. HOW CASTING DEFECTS AFFECT QUALITY OF ELECTRO-PLATED ZINC DIE CASTINGS.**
Wm. H. Safranek, Asst. Chief, Electro-Chemical Engineering Div.
Battelle Memorial Institute

☐ **PAPER 13. THE COMPETITIVE ASPECTS OF THE PERMANENT MOLD PROCESS.**
Frank Ross, Chief Engr.,
Permanent Mold Die Co., Inc.

☐ **PAPER 15. ALUMINUM SAND CASTING, A COMPETITOR OF DIE CASTING.**
Thomas B. Pfaff, Asst. Foundry Supt.
Pontiac Motor Div., General Motors Corp.

☐ **PAPER 16. DICTAPHONE CORPORATION MAGNESIUM DIE CASTING EXPERIENCE.**
Frederick W. Roberts, V. P. Engrg. & Res.,
Dictaphone Corp.

☐ **PAPER 17. PLASTICS—COMPETITOR OF DIE CASTINGS.**
Wm. O. Bracken, Plastics Sales Dev.,
Cellulose Products Dept.,
Hercules Powder Co.

☐ **PAPER 18. AUTOMATION IN DIE CASTING.**
Lee Garretson, Div. Proc. Liaison Engr.
Tom E. Nadeau, Sr., Die Cast Engr.
Mfg. Engrg. Dept.
Hardware & Access. Div., Ford Motor Co.

☐ **PAPER 19. SHORT RUN PRODUCTION PRACTICE IN DIE CASTING.**
D. H. Naffziger, Process Engr.,
Delco-Remy Div., General Motors Corp.

☐ **PAPER 20. ADVANCES IN IMPREGNATION MATERIALS AND TECHNIQUES.**
George J. Caudron, V.P.,
American Metaseal of Detroit

☐ **PAPER 21. A CASE STUDY IN ESTABLISHING CASTING COSTS.**
Urban F. von Rosen, C.P.A., Partner,
Soloway & von Rosen

☐ **PAPER 22. QUALITY CONTROL AND THE DIE CASTING MACHINE.**
Earle W. Rearwin, Chief Engineer,
Die Cast Machines, Reed-Prentice Div.,
Package Machinery Co.

☐ **PAPER 23. THE EFFECT OF DIE CASTING PRACTICE ON CASTING QUALITY.**
Al Sugar, Field Engr.
Cast Master Div., Hydraulic Press Mfg. Co.

☐ **PAPER 24. REVIEW OF METHODS TO OBTAIN IMPROVED CORROSION RESISTANCE FOR PLATED ZINC DIE CASTINGS.**
Donald R. Millage, Group Leader, and
Edward Romanowski, Res. Chemist, and
Henry Brown, Res. Dir.
Udylite Research Corp.

☐ **PAPER 25. VACUUM DIE-CASTING—A RESUME OF PROGRESS TO DATE.**
Hiram K. Barton, President
Hiram Barton Associates

☐ **PAPER 26. SOME EFFECTS OF VACUUM CASTING ON SURFACE FINISH.**
E. L. Simpson, Supt.,
Casting and Molding Dept.
Bell & Howell Co.

☐ **PAPER 27. USE OF VACUUM IN PRODUCTION OF HIGH QUALITY ALUMINUM AND ZINC DIE CASTINGS.**
Joseph A. Woltering, V. P.
Hamilton Die Cast, Inc.

Society of Die Casting Engineers, Inc.
19382 Jas. Couzens Hwy., Detroit 35, Michigan

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News of the Industry

AFS FOUNDRY CONGRESS

Further evidence of American interest in foreign markets comes from an announcement this month by the American Foundrymen's Society, Des Plaines, Illinois, international technical society for the metal casting industry. The Society announces that the 29th International Foundry Congress has been scheduled for Detroit's Cobo Hall in May 1962, to coincide with the 66th AFS Castings Congress and Exposition. At this event, the AFS will play host to the entire International Association of Foundry Technical Committees, comprising technical groups in 22 countries around the world.

To permit maximum concentration on the huge 1962 event, the Society has announced cancellation of a limited exposition originally scheduled to be held at San Francisco next May. Instead, the Society will stage, in San Francisco in May, its 65th technical Castings Congress as one of the largest technical symposia on foundry practice ever held. Over 80 papers covering all phases of metal castings technology have been definitely committed for 1961 and officials are confident that more than 100 papers will finally be presented.

SHOW IN DETROIT

The Design Engineering Show, taking advantage of the opening of Cobo Hall, will move to Detroit for the first time in 1961. The exposition and the concurrent conference will take place May 22 through 25, it was announced by Clapp & Poliak, Inc., New York exposition management firm, which produces the show.

HILKER CO. NAMED

The appointment of the Hilker Co. as exclusive sales representatives in the southeastern territory was announced recently by Harry Bollman, Sales Manager of The Newton-New Haven Company, custom producers of zinc and aluminum die castings.

(Continued on page 26)

NATIONAL OFFICERS

The Society of Die Casting Engineers, Inc. 1961

John L. MacLaren
President

Following graduation from the University of Toronto (1948) in Mechanical Engineering, Mr. MacLaren spent four years with the Otis Elevator Company before attending Harvard Graduate School of Business Administration for a Master's degree. Since then he has been a sales development engineer for the Detroit office of Aluminum Limited Sales, Inc. He was chairman for the Society's First National Die Casting Exposition and Congress. Mr. MacLaren has been an active member of the Detroit Chapter for three years. He belongs to the American Foundrymen's Society, The Society of Automotive Engineers, and the American Society of Metals.

Earle W. Rearwin
Vice President

A graduate Mechanical Engineer with 20 years' experience in die casting, Mr. Rearwin holds several patents in design techniques and has authored numerous articles on die casting. He is Chief Product Engineer on die casting for the Reed-Prentice Division of Package Machinery Company. Mr. Rearwin was one of the founders of the New England Chapter, is a past National Director and has served on the editorial board of the DIE CASTING ENGINEER.

M. R. Tenenbaum
Secretary-Treasurer

As a charter member of the Detroit Chapter in 1951, Mr. Tenenbaum has been active on a national level as Secretary-Treasurer. It has been through his constant day to day supervision and attention that our National Office has attained its high degree of efficiency. He is a graduate Chemical Engineer from Case Institute of Technology, has been active in die casting for 16 years, and is associated with the Lester Phoenix Company as a sales engineer.

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New Ideas, New Products

A 3000 series elevated temperature thermocouple reference junction designated Model TRJ-3006 is being introduced by Temptron, Inc., 7030 Darby Avenue, Reseda, California, national specialist in the field of temperature measurement.

The low cost, compact, portable unit, developed for in-plant and laboratory use, is a basically stable device designed around a simple, reliable, on-off type temperature control system which operates on a small temperature differential. The cycling temperature effect is dampened by a heat sink until the temperature variation is typically less than —1/6° F.

The unit's error-free screw tie point terminals allow direct thermo element contact thus eliminating errors normally present due to temperature gradients across the connectors.

The Cleveland Automatic Machine Company, Cincinnati, Ohio, has incorporated major design changes in their popular Model 400 Cleveland Die Casting Machine, which has a strain gage tested locking pressure of 400 tons or better, as tested by the Society of Die Casting Engineers' method using a calibrated test ring.

The cast steel toggle mechanism has been positioned to operate in the horizontal plane, to provide maximum accessibility for inserting ejector pins. The movable platen is supported by rollers riding on hardened steel plates, to relieve the four tie bars of the weight of the platen and die. Ejector pin holes and platen T-slots follow the S.D.C.E. recommended pattern.

More detailed information on the Cleveland Model 400, as well as on other size Cleveland Die Casting Machines, which include 100, 250, 650, 850, 1000 and 2000 ton models, can be obtained by writing The Cleveland Automatic Machine Company, 4932 Beech Street, Cincinnati 12, Ohio.

New Literature

ULTRASONICS AND ITS INDUSTRIAL APPLICATIONS. By O. I. BABIKOV. Cloth—230 pages—$9.75.

Ultrasonics—one of industry's most exciting new tools—is dealt with in all its technical aspects in a new book to be published this month. ULTRASONICS AND ITS INDUSTRIAL APPLICATIONS by O. I. Babikov is translated from Russian and published by Consultant Bureau, New York.

While the volume covers recent Soviet advances in this field, its scope is universal, and it will serve as an indispensable aid to all technicians and scientists interested in the industrial applications of ultrasound.

DE-STA-CO CATALOG 77

A 36-page Catalog 77, on the full De-Sta-Co line of general-purpose and special-use toggle clamps, has just been published by the Detroit Stamping Company, 330 Midland Avenue, Detroit 3, Michigan. The colorful publication has been specifically designed as a 'job-aid' for tool and manufacturing engineers, purchasing agents and designers in diversified industrial fields. Copies available when requested on company letterhead.

ALUMINUM CASTING ALLOY INGOT

Aluminum Company of America recently announced the availability of new and completely current aluminum ingot literature, including data developed through a recently-completed quality control program.

"Aluminum Casting Alloy Ingot," as the new, 12-page brochure is entitled, presents revised terminology, text, and tabulated information on the benefits to metal users of methods employed by Alcoa to insure the production of top-grade ingot. The booklet supplants literature containing reference to "aluminum pig," the former designation for primary aluminum, which was dropped last August to reflect the superior quality of metal now available.

"Aluminum Casting Alloy Ingot" can be obtained from any Alcoa sales office, or by writing 767 Alcoa Building, Pittsburgh 19, Pa.

INSPECTION LIGHTS

Inspection Lights—A 4-page bulletin describing and illustrating 12 types of inspection lights, has been issued by Welch Allyn, Inc., 204 Jordan Rd., Skaneateles Falls, N. Y. Included are direct types for surface or interior inspection, prefocused lights, adjustable focus lights, lights combined with magnifying lenses, lights with rotatable mirrors for right angle vision in relatively large bores, and borescopes for right angle vision in small bores.

News of the Industry

(Continued from page 22)

CHANGES AT DOW

The Dow Chemical Company today announced plans to close the Die Casting Department of its Bay City (Michigan) Plant, 801 Andre Street. The Bay City Plant is operated by The Dow Metal Products Company, a Dow division.

ALCOA DIE CASTING

Aluminum Company of America today announced the start of operations at the world's most modern aluminum die casting plant—the company's new Edison works near Metuchen, N. J.

Facing the New Jersey Turnpike, the one-story aluminum walled manufacturing facility and complementing two-story administration building of blue enameled aluminum panels, already has become an area landmark because of its attractive architectural use of the light metal.

Works Manager Charles G. Wistar said initial limited operations involved production on several die casting machines, but noted that the new plant also would be a producer of permanent mold castings when additional facilities are installed next spring.

REYNOLDS SPONSORS FILM

The Antwerp Film Festival Committee announces the award of its highest motion picture honor, the Diplome De Merite Exceptionnel, to a Louisville company, Vogue Film Productions, for the industrial motion picture, "Welding Aluminum—Different, Not Difficult."

A separate award was presented to the film's sponsor, Reynolds Metals Co. of Richmond, Va.

According to Hal Vinson, president of Vogue, the festival is held each year by the Ministry of Labour, Kingdom of Belgium, to gather, study and compare industrial films. The 1960 competition included 450 films from 30 countries. The top 38 films were awarded to Exceptional Merit rating.

By A. F. Bauer *(Continued from page 10)*

matically poured in 9 seconds into the shot sleeve with every shot, the equipment being a modified Lindberg ladle with a crucible capacity of 150 pounds and a maximum metering capacity of 100 pounds of aluminum. We believe it to be the largest automatic ladling unit used in the industry.

The auto-ladle operates with an air pressure of approximately 24 ounces, and the amount of metal poured can be adjusted by varying the air pressure and pouring time. The ladling unit is set in one of our reverberatory type holding furnaces with a capacity of 7,500 pounds of aluminum. Accuracy in metering of $\pm 0.5\%$ is obtained due to preventive maintenance and periodic cleaning performed at intervals of four weeks.

After the castings have been produced they are moved over a conveyor to a hydraulic press where loose pieces are removed by the third man of the team. He visually inspects every casting for surface defects, broken cores, etc., and records the number of castings produced and puts the engine blocks on skids from where they are moved into the cleaning operation. He also puts new liners on the conveyor to be heated.

Very few people are needed to clean the blocks since the gate is broken off automatically in the die casting machine. The trimming is done on home-built hydraulic presses and a few more men do some burr removal in areas not readily reached by the trimming tools.

After trimming and cleaning, the blocks are rolled over the conveyor into a unit which performs both dry and wet pressure testing. The dry pressure testing is accomplished at the rate of approximately 125 blocks per hour. The water channel area is checked with 15 p.s.i. air pressure, the oil channel area with 30 p.s.i. air pressure. Both test circuits are controlled separately. When a leak is detected by the air method the engine block is submerged in water to determine its location. At the present time 92% of all the engine blocks produced are pressure tight as cast, and the remaining 8% are impregnated. Actual scrap due to porosity which cannot be sealed by impregnation is almost zero.

Next, the 12 holes for the hydraulic valve lifters are drilled to open up passages for lubricant from the oil gallery. We originally had cast these holes but found it necessary to close them up as it would have been too difficult to seal the holes with rubber plugs in the pressure testing unit. In addition to pressure testing, the casting quality is controlled by taking cuts daily through the heavy sections, by determining the physical properties of test specimens taken from the walls of the castings, by dimensional checking and by Magnaglo inspection for invisible cracks in the cast iron sleeves.

FUTURE PROSPECTS

Now that the aluminum engine block has made its appearance it is important to assess the future course which this development may take. The trend in automobile manufacture today seems very strong in the

(Continued on page 28)

direction of smaller and lighter passenger cars. The horsepower race of the recent past is being replaced by a greater emphasis on light weight, low cost power plants as the main engineering objective for small compact cars. I feel therefore that future engine development will stress both lightness and economy and that these areas provide aluminum with an excellent opportunity to compete with gray iron.

It seems to be a general law of human nature as well as of physics that action generates reaction and so none of us should be surprised to learn that the gray iron foundry has begun a strong program to develop and produce lighter and better engine blocks and cylinder heads using thinner walls and improved quality. This is only a normal course of development. In the last analysis aluminum will have to compete with gray iron on a cost basis and the contest will not go to aluminum by default. Aluminum competes with gray iron engine blocks in three different casting processes:

1. The semi-permanent mold process chosen by Buick and Oldsmobile for their V-8 engines.
2. The low pressure casting method used by Chevrolet for its air-cooled Corvair engine.
3. The die casting process selected by American Motors and Chrysler for their six-cylinder, in-line engine.

For the time being each of these three casting processes will be used, but this is a transitional approach and in the long run only those processes which offer the greatest cost advantage will survive. I of course have stated frequently enough my conviction that the die casting process has the edge over the other casting methods and offers the best chance of competing with gray iron. I say this because the elimination of sand cores and the use of the fastest possible production speeds are absolutely essential to overcome the higher price of aluminum compared with gray iron and to arrive at a less costly end product. Even those who use the semi-permanent mold process and the low pressure casting method concede that die casting will prove more economical when the part can be designed without undercuts.

Comparison of an aluminum die cast block with a sand cast gray iron block will clearly show that the die cast engine block with all the holes cast-in represents a much more finished product than the unmachined gray iron block with which it must compete. The relatively high capital investment for the construction of the casting dies which so many see as die casting's biggest disadvantage can to a great extent be compensated for by the tremendous savings in the machining equipment for these blocks. When the advantages of die cast aluminum blocks are fully realized, I believe it will be possible to complete the total tooling for machined aluminum engine blocks at costs appreciably below those for the pattern equipment and the transfer machine necessary to finish-machine a gray iron engine block.

Since we engineers are by nature conservative it is to be expected that this development will take its time. Gray iron engines will be changed gradually to aluminum blocks and this transition from one to the other will take several years. This is a natural and desirable development because it will permit the full test of aluminum as an engine material from the point of view of both engineering and economics. It would also provide a longer period of transition for those who are affected by the march of aluminum.

The adaptability of aluminum and its alloys to modern labor saving casting methods is aluminum's biggest advantage over gray iron. It may take time for these advantages to be fully realized, but the time will come, for nobody can stop progress.

By G. Triulzi *(Continued from page 14)*

While we are waiting for the positive results which will surely come, an 8-cylinder block is being designed. Of course in this case it will also be necessary to introduce some modifications on the original design, but they have already been accepted by the designers because of the special features of the machine and the experience of the die manufacturers. The solution of this problem is near and will give die casting new marketing possibilities in allied fields, such as the manufacture of tractors.

Russians have already entered this field and have made aluminum die castings with good mechanical properties; previously these were made of cast iron; some of the pieces reach 35 lbs. of aluminum. Their success is due to the use of suitable machines and very good dies.

In closing, I would stress the fact that such important problems cannot be solved unless the designer, the metallurgist, the die manufacturer and the machine maker cooperate closely, and all of them should be experienced and broad-minded.

DIE CASTING ENGINEER

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To answer Box number advertisements, address response to: Box . . ., Die Casting Engineer, 19382 James Couzens Highway, Detroit 35, Michigan.

WANTED — Opportunity in engineering capacity, have limited experience in tool estimating, design, follow up and customer contact. 30 years old, resume on request. Write Box 125.

TWO manufacturers representatives in the Detroit area seek additional quality lines to offer to die casters and the automotive industry in Michigan, Ohio and Indiana. We are certain that our 12 years of experience and service to industry, and the contacts we have developed, could be of value to you. If you think so, too, please write Box 124.

VERSATILE die cast man is looking for a man size challenge to utilize all his training in production, sales, administration, and engineering. Graduate engineer with twenty years in the industry. Setting up a new shop from scratch, improving an older one, or a temporary foreign assignment is my goal. Write Box 123.

WANTED—ESTIMATOR. Aluminum and zinc experience, both casting and secondary operations. New company. Write experience, resume. Box 126.

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